

What is force?

- Amount of effort required to do something
- Energy applied on something
- Action applied to an object
- Physical strength a person has
- Energy transferred from one object to another
- Something to do with work

Force \rightarrow action that causes an object to change states

What are types of forces?

- Constant
- Centripetal
- Applied → push, pull
- Gravitational
- Electromagnetic
- Frictional
- Spring
- Tension
- Normal
- Drag (air, water)
- Lift

Ways to apply forces:

1. Contact:

- Applied (push, pull)
- Frictional
- Normal
- Drag
- Spring
- Tension

2. Field:

- Gravitational
- Electromagnetic

Newton's Laws:

1. An object in motion stay in motion or an object at rest stays at rest unless acted upon by an outside force.

"Law of Inertia"

2. $\sum \vec{F} = m\vec{a}$

Net Force = sum of all forces in one direction

$\sum \rightarrow$ Sigma, means "sum of"

3. Forces come in pairs.

Short Derivation of Newton's 2nd Law:

— Start with impulse-momentum thm.

$$\overline{F} \Delta t = m \Delta \overline{v}$$

$$\overline{F} = m \left(\frac{\Delta \overline{v}}{\Delta t} \right) = \overline{a}$$

$$\overline{F} = m \overline{a}$$

Equilibrium v. Non-Equilibrium:

- Equilibrium \rightarrow forces balance each other

$$\sum \vec{F} = 0$$

- NO acceleration!

- Happens in two ways:

1. Object at rest

2. Object at constant velocity

• Non-equilibrium \rightarrow unbalanced forces producing a net force

$$\sum \vec{F} = m\vec{a}$$